The Change of the Sign of the Constant of Hall in the Ordering of Atoms in an Alloy

SOV/20-125-3-17/63

A diagram shows the curves for the dependence of E_H on B for a sample of Ni_3Mn of ordered grouping ($\eta \sim 1$) of the atoms. In this case, R_s is equal to $-0.637.10^{-12}$ v.cm/a.gauss. The diagram contains also the similar curves for the sample if the degree of the long-range order is lower than 1. All the curves plotted for such a treatment of the alloy show a noticeable decrease of E_H if B increases. E_H passes through the value zero at the temperatures of liquid nitrogen and liquid helium. In the case of partially ordered states or of a mixture of ordered and non-ordered phases, E_H and v_H may be determined according to the above-mentioned formula. In the way discussed in the present paper, the shape of all the curves shown in the diagram may be qualitatively explained. There are 1 figure and 10 references, 6 of which are Soviet.

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The Change of the Sign of the Constant of Hall in the Ordering of Atoms in an Alloy SOV/20-125-3-17/53

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute for the Physics of Metals of the Academy of Sciences USSR) Fiziko-tekhnicheskiy institut Akademii nauk SSSR (Physical-technical Institute of the Academy of Sciences USSR)

SUBMITTED: January 29, 1959

Card 4/4

68621

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S/126/60/009/02/006/033
E032/E335

AUTHORS: Volkenshteyn, N.V. and Fedorov, G.V.

TITLE: Temperature Dependence of the Hall Effect of Ni_3Mn Alloy

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 2, pp 187 - 194 (USSR)

ABSTRACT: Measurements of the Hall Effect were made for a nickel-manganese alloy of an approximately stoichiometric composition in the disordered state as well as in the state with degrees of distant ordering, in the temperature range from room temperature down to 4.2 °K. The alloy was produced in a high-vacuum high-frequency furnace from nickel and manganese of 99.99% purity. The ingots were homogenization annealed at 1 000 °C for 6 hours and then cut into rods; the rod from the central part was rolled into strip from which 10 x 4 x 0.32 mm specimens were prepared. The experiments were made on 5 specimens, heat-treated as follows:
1) quenching from 800 °C; 2) quenching from 600 °C;
3) quenching from 800 °C followed by soaking at 480 °C for 10 hours; 4) quenching from 800 °C followed by

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E032/E335

Temperature Dependence of the Hall Effect of Ni_3Mn Alloy

soaking at 480 °C for 10 hours plus soaking for 16 hours at 460 °C and for 28 hours at 400 °C; 5) quenching from 800 °C followed by soaking for 10 hours at 480 °C, for 16 hours at 460 °C, for 28 hours at 400 °C and for 72 hours at 350 °C. The measured results are given in the plots, Figures 1-9. These show that at room temperature specimen 1) behaves as a paramagnetic with a small positive Hall constant R_0, which remains positive right down to the helium temperature (Figure 1). Specimen 2) was found to have properties which are characteristic of ferromagnetics (Figure 2) and a reduction of the temperature to the nitrogen temperature led to a change in sign of the Hall constant which became negative; further reduction in the temperature resulted in an increase in R_0 leading to a change in the sign of the entire effect. Comparison of the plots Figures 1 and 2 indicates that the Hall effect is very sensitive to the method of freezing the disordered state, i.e. to the speed of cooling. It is probable that in the case of slower cooling, even from a temperature above the Kurnakov point, distant order ranges will appear which are ferromagnetic at room temperature. Specimen 3)

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Temperature Dependence of the Hall Effect of Ni_3Mn Alloy

was quenched from a temperature below the Kunakov point and had a certain equilibrium degree of distant order (Figure 3); transition into a partially ordered state brought about a sharp change in the character of the $e_H = f(B)$ curves; the behaviour was a typically ferromagnetic one. An increase in the long-range order (specimens 4 and 5, Figures 4 and 5) resulted in a considerable decrease of the spontaneous Hall constant R_s at room temperature, whilst the ordinary Hall constant changed only little. It can be concluded that appearance of ferromagnetism during the process of ordering brings about a sharp change in the shape of the $e_H = f(B)$ curves. The decrease in the R_s with increasing degree of ordering is apparently due to a sharp drop in the specific electric resistance. In spite of the fact that there is no change in the chemical composition of the alloy, transition from the disordered state to the ordered state seems to change completely the behaviour of the substance (Figures 6 and 7);

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Temperature Dependence of the Hall Effect of Ni_3Mn Alloy

whilst in the disorder state (Curve 1) R_0 and R_s decrease with increasing temperature, both these values increase with increasing temperature for all degrees of ordering. The dependencies of R_s and R_0 on the heat-treatment temperature, i.e. on the state of ordering, indicate that the ferromagnetic Hall constant R_s is particularly sensitive to the transition from the disorder to the ordered state and this manifests itself by a sharp maximum at a temperature which approaches the beginning of the ordering temperature. The maximum was observed at all the temperatures and particularly at room temperature, since at this temperature the transition occurs from the paramagnetic state into the strongly ferromagnetic state. The spontaneous Hall constant R_s, as well as the ordinary Hall constant R_0 change strongly as a result of ordering of the Ni_3Mn alloy. The

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Temperature Dependence of the Hall Effect of Ni_3Mn Alloy

temperature dependence of R_0 in ferromagnetics differs greatly from that pertaining to non-ferromagnetics. It was found that the spontaneous Hall constant R_s and the ordinary Hall constant R_0 of the alloy in the disordered state depend strongly on the method of fixing this state. Both constants are interrelated and change as a result of ordering of the alloy. During ordering R_0 changes sign; as regards the temperature dependence it differs from the Hall constant of non-ferromagnetic metals. There are 9 figures, 1 table and 17 references, 2 of which are German, 1 Scandinavian, 5 English and 9 Soviet.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Metal Physics of the Ac.Sc., USSR)

SUBMITTED: September 29, 1959

4

Card 5/5

SMIRNOV, Anatoliy Filippovich, doktor tekhn. nauk, prof.; ALEKSANDROV, Anatoliy Vasil'yevich, kand. tekhn. nauk, dots.; MONAKHOV, Nikolay Ivanovich, kand. tekhn. nauk, dots.; PARFENOV, Dionisiy Fedorovich, dots.; SKRYABIN, Aleksandr Ivanovich, kand. tekhn.nauk, dots.; FEDORKOV, Georgiy Vasil'yevich, kand. tekhn. nauk, dots.; KHOLCHEV, Vasiliy Vasil'yevich, kand. tekhn. nauk, dots.; DARKOV,A.V., prof., retsenzent; STARSHINOV, K.K., kand. tekhn.nauk, retsenzent; BURCHAK, G.P., kand. tekhn.nauk, red.; VERINA, G.P., tekhn. red.

[Strength of materials] Soprotivlenie materialov. Moskva, Vses. izdatel'sko-poligr.ob"edinenie M-va putei soobshcheniia, 1961. 591 p. (MIRA 14:12)

1. Chlen-korrespondent Akademii Stroitel'stva i Arkhitektury SSSR (for Smirnov).

(Strength of materials)

VOLKENSHTEYN, N.V.; FEDOROV, G.V.; SHIROKOVSKIY, V.P.

Anisotropy of the Hall effect in ferromagnetic materials. Fiz. met. i metalloved. 11 no. 1:152-154 Ja '61. (MIRA 14:2)

1. Institut fiziki metallov AN SSSR.
(Ferromagnetic materials) (Hall effect)

S/126/61/011/002/009/025
E111/E452

AUTHORS: Palatnik, L.S., ~~Fedorov, G.V.~~ and Ravlik, A.G.

TITLE: Electron-Diffraction Investigation of Iron-Carbon Alloys of Varying Composition Prepared by the Use of Electron Bombardment

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.2, pp.236-239

TEXT: The authors have developed a method for preparing Fe-C alloys of varying composition by evaporation under the influence of electron bombardment. Thin films can be obtained for electron-diffraction study. In preparing their specimen of varying composition both simultaneous and successive condensation of iron and carbon were used. To evaporate carbon a pure carbon specimen was made the anode and a tungsten spiral the cathode, a constant accelerating field being produced with the aid of a 3.6 kV, 500 W transformer and a rectifier in a bridge circuit. A feature of the circuit is the provision of an electronic relay which switches off the high voltage if the anode current rises beyond the permissible value through the occurrence of a gas discharge (either in carbon vapour or gases evolved from the carbon). The circuit provides a

carbon evaporation rate of 150 mg/hour with a 0.15 cm^3 specimen and 400 W. Iron evaporation was obtained using a conical tungsten heater coated with alundum. For deposition, single crystals of rock-salt or rock-salt condensed on glass were used, a special heater being provided by which the temperature could be raised quickly to 400°C. The electron-diffraction investigation of the iron-carbon alloy prepared in this way was effected in a type ЭМ-3 (EM-3) electron microscope with a diffraction attachment. The error in inter-planar distance determinations did not exceed 0.02 Å. It was found that simultaneous condensation of iron and carbon on cold surfaces gives a mixture of ferrite with "amorphous" carbon (or a finely dispersed carbon-rich phase). By condensation on to a surface at about 200°C, ferrite and cementite are formed whose diffraction lines are very diffuse; clear and intense interference rings of these components are obtained when the surface is at 250 to 400°C. The carbon lines became more intense with increasing carbon content (its concentration can be found by electron-diffraction phase analysis). With successive condensation on to a surface at about 100°C, the pattern shows iron rings and a halo for "amorphous" carbon; at 250°C and over,

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E111/E452

Electron Diffraction ...

ferrite and cementite are present. On cementite electron diffraction patterns the lines (002), (111), (020) and (221) were found. These are generally absent from X-ray patterns (Ref.3). When thin layers of carbon and iron were deposited successively on to a surface at 250°C, a hexagonal structure with closest packing was found with a = 2.75 and c = 4.36 Å (lines (100), (002), (101), (102), (110), (103), (112), (203), (120), (121) were seen). Annealing at 600°C produces cementite. Some indications of such a phase have been obtained, e.g. by K.H.Jack (Ref.8: J.Iron and Steel Inst., 1951, 169, 1, 26), L.J.E.Hofer, E.M.Cohn and W.C.Peebles (Ref.9: J.Amer Chem. Soc., 1049,77,1,189) and others (Ref.7 and 10). In further experiments, a 50% nickel-iron alloy was used in place of iron. The Fe-Ni-C alloy deposited on a single-crystal surface at about 400°C showed a gamma phase with a lattice period of 3.62 Å corresponding to about 2% C. The authors point out that the method developed can be used to prepare carbon-containing binary and multicomponent alloys and study their various non-equilibrium states. There are 5 figures and 10 references: 7 Soviet and 3 non-Soviet.

Card 3/3 Khar'kov Polytech Inst im V.I. Lenin

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S/126/61/011/005/015/015
E073/E335

18.8200 also 1145

AUTHORS: Palatnik, L.S., Fedorov, G.V. and Il'inskiy, A.I.

TITLE: Substructure and Microhardness of Vacuum Condensates of Copper

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol. 11, No. 5, pp. 815 -816

TEXT: The physical properties of thin metallic layers produced by evaporation in vacuum is of great interest, particularly the relation between the structure and the properties of condensates of various metals. In this note some results are described of investigations of the substructure and the microhardness of condensated copper films produced from copper of an initial purity of 99.995%. Evaporation was in vacuum of 10^{-5} mm Hg at a rate of 6-8 mg/min, using as a basis sheet copper, the temperature of which was maintained constant during the experiment. The microhardness of films 40 ± 5 μ was measured by means

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S/126/61/011/005/015/015

Substructure and Microhardness..E073/E335

of a ПМТ-3 (PMT-3) instrument with automatic load application, described in earlier work of two of the authors and V.M. Kosevich (Ref. 3 - Zavodskaya laboratoriya, 1958, 6, 756). The substructure of the films was investigated by means of ionisation apparatus УРС-50И (URS-50I) with $Cu_{k\alpha}$-radiation; type II distortions and block mosaics were evaluated on the basis of the width of the interference lines. Furthermore, the dislocation density was evaluated; the upper limit of the dislocation densities was evaluated directly from the widening of the interference lines and the lower limit from the size of the mosaic blocks. The results are given in a graph and in the following table:

X

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Base temperature, °C	Dislocation density $\rho \cdot 10^{11}$, cm^{-2}	
	ρ_{top}	ρ_{bottom}
40	35	13
180	2.8	1.2
300	0.7	0.2

The maximum dislocation densities, 1.3 x 3.5 x 10^{12} cm^{-2}, are higher by one order of magnitude than those determined by J. Williamson and R. Smallman (Ref. 5 - Problemy sovremennoy fiziki, Vol. 9, 1957, p. 95) by X-ray methods for massive metal subjected to very high plastic deformation at low temperatures. The results are in good agreement with those of G.A. Basset and D.W.L Pashly (Ref. 6 - Inst. Metals, 1959, 87, 12, 449), who determined the dislocation density in condensed silver

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S/126/61/011/005/015/015
Substructure and Microhardness E073/E535

films of 1 000 - 2 000 Å thick (10^{10} - $10^{1?}$ cm^{-2}). The high microhardness of the films investigated by the authors of this paper (maximum of about 300 kg/mm^2) is attributed to the large number of dislocations and other disturbances of the regular crystal structure which are uniformly distributed throughout the volume. The strength of the films was 3-4 times as high as for massive copper in the annealed state. If the temperature of the base is increased to 450 °C, the microhardness of the condensed film decreases to values that are characteristic for annealed copper (H_{μ} = 40 - 45 kg/mm^2). This is probably due to an increase in the mobility of the atoms of the condensing metal which takes place as a result of increasing the temperature of the base and leads to a decrease in the density of the defects of the crystal lattice and thus to a decrease in the microhardness. It can be seen from the graph that the increase in the microhardness of the condensate on reducing the base temperature is accompanied by a refining of the mosaic blocks and this is in agreement with modern views
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E073/E335

Substructure and Microhardness ....

that hardening of the pure metals is caused by refining of the mosaic blocks. With increasing temperature of the base the type II microstresses are reduced. Copper films form with a base temperature of 180 °C for only insignificant micro-distortions, $\Delta a/a = 0.5 \times 10^{-3}$, and these decrease still further with increasing temperature. However, the microhardness of a condensate produced in the case of a temperature of the base of 180 °C is over four times higher than the microhardness of films produced in the case of a base temperature of 450 °C (H_μ = 270 kg/mm^2 and 60 kg/mm^2, respectively). [Abstractor's note: "kg/cm^2" is obviously a printing error]. It is pointed out that for the given mechanism of hardening of copper, the type II stresses are apparently not a characteristic of the substructure, which is necessary for conserving the hardened state. There are 1 figure, 1 table and 8 references: 7 Soviet and 1 non-Soviet (English - see text).

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Khar'kov Polytech Inst im V. I. Lenin

24.7600 (1035, 1163, 1482) 18.8100 1145 1043 1559

S/048/61/025/011/015/031
B104/B102

AUTHORS: Volkenshteyn, N. V., and Fedorov, G. V.

TITLE: Temperature dependence of electrical conductivity and of the Hall effect of metallic gadolinium

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 25, no. 11, 1961, 1379 - 1382

TEXT: Gadolinium belongs to the transition elements with incomplete 4f shell. Due to this shell structure, exchange interaction differs from that in ferromagnetic 3d transition elements. The temperature dependence of the Hall coefficient, R_s, in the paramagnetic region differs from that in the ferromagnetic one (Fig. 1). The empirical relations $R_s = a(\sigma_{s_0}^2 - \sigma_{s_T}^2)$ (1) and $\Delta\varrho = c + b\sigma_{s_T}^2$ (2) are given. σ_{s_0} denotes the spontaneous magnetization at 0^{o}K; σ_{s_T} is the spontaneous magnetization at temperature T, $\Delta\varrho$ is the drop in resistivity of the ferromagnetic below the Curie point. It is shown

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S/048/61/025/011/015/031
B104/B102

Temperature dependence of...

that the linear relationship between R_s and $\Delta\rho$ which follows from (1), actually exists in the temperature range of 78 - 270°K, and, thus, (1) is valid at low temperatures. The maximum in the temperature dependence of the ordinary Hall coefficient, R_o, is ascribed to a para-process in the saturation range. R_o in ferromagnetics differs from the Hall coefficient in non-ferromagnetic metals. The temperature dependence of R_s is the same for Gd and Ni; however, the maximum of R_s in Gd is higher than that in Ni by a factor of 20. The conclusion is drawn from the foregoing that the particular character of the electron shell of gadolinium, while not changing the character of the temperature dependence of R_s, does change the degree of dependence. It follows that the extraordinary Hall effect is determined only by the inner effective field and that its temperature dependence is related to that of the inner effective field which is determined by spontaneous magnetization. The abnormally high value of R_s and the unusual spin-orbit interaction do not contradict general concepts. There are 5 figures and 13 references: 9 Soviet and 4 non-Soviet. The three references to English-language publications read as follows:

X

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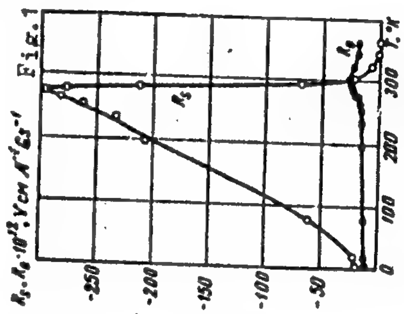
30070
S/048/61/025/011/015/031
B104/B102

Temperature dependence of...

Allison F. E., Pugh E. M., Phys. Rev., 102, 1281 (1956); Karplus R., Luttinger J. M., Phys. Rev., 95, 1154 (1954); Luttinger J. M., Phys. Rev., 112, 739 (1959).

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Physics of Metals of the Academy of Sciences USSR)

Fig. 1. Temperature dependence of Hall coefficients R_s and R_o in Gd.



Card 3/3

VOLKENSHTEYN, N.V.; FEDOROV, G.V.

Temperature dependence of the Hall effect in pure ferromagnetics.
Zhur. eksp. i teor. fiz. 38 no.1:64-68 Jan '60. (MIRA 14:9)

1. Institut fiziki metallov Akademii nauk SSSR.
(Hall effect) (Magnetic materials)

S/126/62/013/003/014/023
E039/E135

AUTHORS: Palatnik, L.S., Fedorov, G.V., and Fedorenko, A.I.

TITLE: X-ray examination of Zn—Sb alloys for samples of variable composition

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.3, 1962, 426-431

TEXT: According to the literature there are three chemical compounds in the Zn—Sb system, namely: ZnSb, Zn_4Sb_3 and Zn_3Sb_2. Only ZnSb is stable at room temperature. The others are unstable at temperatures less than 200 °C and have some high temperature modifications. When alloys are condensed in vacuo it is possible to fix non-equilibrium and metastable conditions in the alloy. This is because of the high rate of cooling on condensation. Experiments were performed to investigate the stable and metastable compounds in condensed Zn—Sb for different temperatures at the condenser surface and for different annealing temperatures. For condensation at 45-95 °C the alloy forms a crystalline phase - Zn, η Zn_3Sb_2 and an amorphous

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X-ray examination of Zn—Sb alloys... S/126/62/013/003/005/023
E039/E135

(super-cooled liquid) solution of Sb—Zn. At 95-125 °C crystalline modification compounds ζ - Zn_3Sb_2 and γ Zn_4Sb_3 are formed. In the range 125-150 °C the stable Zn—Sb compound is formed and the metastable modifications β - Zn_4Sb_3 and ζ - Zn_3Sb_2. A detailed investigation at temperatures higher than 150 °C was not carried out because of the selective evaporation of Zn. It is shown that at the low temperatures of condensation more of the high temperature phase is fixed in the sample. This is extremely important in the study of metastable structure in alloys. The annealing of samples of Zn—Sb with variable composition at about 300 °C followed by slow cooling destroys the metastable phase and the stable compound ZnSb forms. There are 2 figures and 1 table.

ASSOCIATION: Khar'kovskiy politekhnicheskiy institut im. V.I. Lenina (Khar'kov Polytechnical Institute imeni V.I. Lenin)

SUBMITTED: July 25, 1961

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03/20/2001 CIA-RDP86-00513R0004126

(super-cooled liquid) solution of Sb—Zn. At 95-125 °C crystalline modification compounds ζ - Zn_3Sb_2 and γ Zn_4Sb_3 are formed. In the range 125-150 °C the stable Zn—Sb compound is formed and the metastable modifications β - Zn_4Sb_3 and ζ - Zn_3Sb_2. A detailed investigation at temperatures higher than 150 °C was not carried out because of the selective evaporation of Zn. It is shown that at the low temperatures of condensation more of the high temperature phase is fixed in the sample. This is extremely important in the study of metastable structure in alloys. The annealing of samples of Zn—Sb with variable composition at about 300 °C followed by slow cooling destroys the metastable phase and the stable compound ZnSb forms. There are 2 figures and 1 table.

ASSOCIATION: Khar'kovskiy politekhnicheskiy institut im. V.I. Lenina (Khar'kov Polytechnical Institute imeni V.I. Lenin)

SUBMITTED: July 25, 1961

L 12480-63 EWP(q)/EWT(m)/BDS AFFTC/ASD JD/HW-2
S/185/63/008/003/002/009

62

AUTHOR: Volkenshteyn, N. V., Galoshina, E. V., Turchinskaya, M. I., Fedorov, G. V. and Tsiovkin, Yu. N.

TITLE: Effect of ordering on electrical magnetic, galvanomagnetic and thermal properties of Ni_3Mn alloy

14 27 — 21

PERIODICAL: Ukrains'kyy Fizychnyy Zhurnal, v. 8, no. 3, 1963, 306-312.

TEXT: The article investigated the electrical conductivity, magnetization, Hall effect and heat capacity of alloys near the stoichiometric composition Ni_3Mn over a wide range of temperatures down to 1.50 K both in disordered and in states with varying degrees of long-range order. The data which were obtained show that the disordered state and the initial stages of ordering where short range order appears are very complex for Ni_3Mn alloy. The temperature dependence of electrical conductivity was investigated near the Curie point. Magnetization measurements were made on single crystals. The Hall emf for ordered state of this alloy as a function of induction has normal character for ferromagnetic materials. The article contains 7 figures and a 6 item bibliography.

ASSOCIATION: Institut Fiziki metallov AN SSSR (Institute of Metal Physics of the Academy of Sciences of the USSR, Sverdlovsk)

Card 1/1

L 17608-63 EWT(1)/EWG(k)/EWP(q)/ S/056/63/044/003/008/053
EWT(m)/BDS/EEC(b)- AFFTC/ASD/ESD-3/IJP(C) Pz-4/Pad AT/JD/HW 77 76

AUTHOR: Volke shteyn, N. V. and Fedorov, G. V.

TITLE: Tempe ature dependence of the electric conductivity and Hall ffect of dysprosium and erbium

PERIODICAL: Zhurn eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 3, 1963, 25-831

TEXT: The ferromagn ic metals Fe, Ni, and Co and the rare earth metal Gd showed anomalously high valu s for the Hall emf. The authors decided to investigate the problem in the regio of transitions from the paramagnetic to the antiferromagnetic phase and vice versa f the rare earth metals Dy and Er for which the magnetic structure is known fr neutronographic data. The specific electric resistance and Hall emf in Dy an Er are measured in the temperature range from 4.2 to 350°K. The transition from p amagnetic to antiferromagnetic phase can easily be discerned on the $\rho(T)$ curves f Dy and Er. An investigation of the specific Hall emf for Dy revealed that extre al values of the effect correspond to transitions from a paramagnetic to antife romagnetic phase and from an antiferromagnetic to

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L 17608-63 S/056/63/044/003/008/053

Temperature dependence ' the electric...

ferromagnetic phase. Or y one maximum of the emf is observed in Er during transition from the anti erromagnetic to the ferromagnetic phase. The Dy Hall effect in the ferromagne ic and antiferromagnetic region exhibits "hysteresis" and changes its sign from ne tive to positive at temperatures between 100 and 150°K. The sign of the Hall eff t in Er is negative through the whole investigated temperature range and no hysteresis is observed. There are 7 figures.

ASSOCIATION: Institut fi ki metallov Akademii nauk SSSR (Institute for Physics of Metals o the Academy of Sciences of the USSR)

SUBMITTED: October 1, 1 2

Card 2/2

ACCESSION NR: AP4023404 S/0048/64/028/003/0540/0544

AUTHOR: Volkenshteyn, N.V.; Fedorov, G.V.; Startsev, V.Ye.

TITLE: Effect of magnetic order on the electric and galvanomagnetic properties of the rare earth metals /Report, Symposium on Ferromagnetism and Ferroelectricity held in Leningrad 30 May to 5 June 1963/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.28, no.3, 1964, 540-544

TOPIC TAGS: rare earths, resistivity, Hall effect, rare earth resistivity, rare earth Hall effect

ABSTRACT: The authors point out that it would be desirable to measure the electrical conductivity and the Hall coefficient on the same pure samples of all the rare earths over a wide temperature range (down to liquid helium temperatures) under uniform conditions, and they assert that they have done this. /Abstracter's note: No experimental details are given, nor any description of the techniques employed./ The interest in measurements of this sort arises from the fact that, although the rare earths all have the same valence electron structure, the electric and galvanomagnetic properties vary greatly from one to another. Some of the results of the

ACCESSION NR: AP4023404

measurements are discussed in the present paper. With respect to temperature dependence of resistivity, the rare earths divide themselves into two groups. In La,Ce, Pr,Nd and Yb there is no region in which the resistivity is a linear function of temperature. The curve for Nd is given; it is smooth and concave to the temperature axis. In Sm,Gd,Tb,Dy,Ho,Er and Tu the resistivity depends linearly on temperature throughout the paramagnetic region, and the curve has a sharp bend at the paramagnetic-antiferromagnetic transition point. The behavior of Eu (curve given) is very peculiar: there is no linear region (up to 300°K), and the peculiarity at the transition point is very marked, there being even a small region in which the resistivity decreases with increasing temperature. This behavior is tentatively ascribed to changes in the conditions of scattering and in the energy spectrum of the current carriers. The Hall emf in all the rare earths is proportional to the induction throughout the paramagnetic and antiferromagnetic regions. In some of the metals the current carriers are holes, and in others they are electrons. The number of carriers per atom varies widely, from 0.17 (holes) in Eu to 3.5 (electrons) in Lu. The behavior of the Hall emf in the ferromagnetic region is very complex. Orig.art.has: 7 figures and 1 table.

ACCESSION NR: AP4023404

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Physics of Metals, Academy of Sciences, SSSR)

SUBMITTED: 00 DATE ACQ: 10Apr64 ENCL: 00

SUB CODE: PH NR REF SOV: 003 OTHER: 006

Card 3/3

L 11457-65 [illegible] (w)/EWT(t)/EWA(bb)-2/EWP(b) [illegible]
Pt-10/Pu-4 [illegible]

ACCESSION NR: AP4046373 S/0020/64/158/003/0586/0589

AUTHORS: Palatnik, L. S.; Fedorov, [illegible] V.; Bogatov, P. N.

TITLE: Investigation of the process of evaporation and volume condensation of alloys

SOURCE: AN SSSR. Doklady, v. 158, no. 3, 1964, 586-589, and insert facing p. 588

TOPIC TAGS: alloy diagram, evaporation, condensation, volume condensation, lead alloy, zinc alloy, alloy composition

ABSTRACT: In view of the relative [illegible] publications devoted to evaporation and condensation of [illegible] and alloys in the absence of ready-made solid condensation surfaces, the authors evaporated metals from alundum crucibles in a [illegible] chamber (volume of approximately 15 liters) filled with argon. Because of the small mean free path of the molecules, the metal[illegible] condensed not on the walls

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L 11457-65

ACCESSION NR: AP4046373

of the vacuum chamber but inside the volume of inert gas. The systems studied were Pb-Sb, Bi-Cd, and Bi-Sb. Two sets of tests were made: in one set the alloys were heated to different temperatures (450—1300C) and argon pressures ([illegible]—10 mm Hg) to check on the selective evaporation and condensation of the individual components. It was found that above a certain temperature, which varies with the alloy, both components evaporate and condense without change in composition. In the second set of tests several metals were condensed simultaneously at temperatures low enough (80 and 250C) to produce supersaturation of the metal vapor. In the case of the Pb-Sb system, the condensed powders were a mechanical mixture of particles of pure components. In the case of Bi-Sb condensates, the particles were solid solutions with a wide range of component concentrations. It is concluded that volume condensation of alloys is greatly influenced by the type of the state diagram of the alloy and by the evaporation temperature. This report was presented by S. A. Vekshinskiy. Orig. art. has: 3 figures.

Card 2/3

L 11457-65
ACCESSION NR: AP4046373

ASSOCIATION: Khar'kovskiy politekhnicheskiy institut im. V. I. Lenina (Khar'kov Polytechnic Institute).

SUBMITTED: 25Jun64 ENCL: 00

SUB CODE: MM NR REF SOV: 009 OTHER: 006

Card 3/3

L 15039-65 EWT(m)/EPF(c)/EWP(t)/EWP(b) Pr-4 AFWL/SSD/LS(mp)-2/ESD(gs)/ESD(t)
JD/JG/MLK
ACCESSION NR: AT4048697 S/0000/64/000/000/0079/0085

AUTHOR: Volkenshteyn, N. V.; Fedorov, G. V.; Galoshina, E. V.; Startsev, V. Ye.

TITLE: Temperature dependence of the electrical and galvanomagnetic properties of rare earth metals

SOURCE: Vsesoyuznoye soveshchaniye po splavam redkikh metallov, 1963. Voprosy* teorii i primeneniya redkozemel'ny*kh metallov (Problems in the theory and use of rare-earth metals); materialy* soveshchaniya. Moscow, Izd-vo Nauka, 1964, 79-85

TOPIC TAGS: rare earth metal, rare earth electrical property, rare earth galvanomagnetic property, rare earth magnetic property, Hall effect, rare earth atomic structure

ABSTRACT: The electrical resistance and Hall effect are excellent indicators of the characteristics of the electronic structure of solid bodies. The present paper describes simultaneous measurements of the electrical resistance and the Hall effect for a large group of highly purified rare earth metals. The electrical resistance of neodymium, europium, gadolinium, terbium, dysprosium, holmium, erbium and ytterbium was measured by a common potentiometer in a metal cryostat at temperatures between room and 4.2K. The electrical resistance differs significantly from that of the usual metals with low resistance. The temperature relationships could be used to divide the rare

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L 15039-65
ACCESSION NR: AT4048697

earth metals into four groups. The first group cont[illegible]ins neodymium and ytterbium, which do not show a linear relationship in the above-ment[illegible]ned temperature interval. The second group includes dysprosium, holmium and er[illegible]ium, which show breaks in the curves and low resistance maxima when passing from the p[illegible]ramagnetic into the anti-ferromagnetic condition. The third group contains gadolinium a[illegible]d terbium, which show a sharp break [illegible] passing from the paramagnetic to the anti-ferr[illegible]magnetic condition, with a linear [illegible] the paramagnetic field. Europium h[illegible] [illegible] shows a sharp drop in electrical r[illegible] [illegible] passage [illegible]

[illegible] change the Hall effect. [illegible]

variations did not change the Hall effect. On the basis of these tests and publications by C. J. Kevan, S. Legvold and G. S. Anderson, it can be seen that all the rare earth ... divided into a "light" group (up to gadolinium) and a "heavy" group, in both ... conductivity depends on the electronic bonding ...

Card 2/3

ACCESSION NR: AT4048697

... of the Hall effect depending on the temperature, induction and other factors. ... specifically. ...

... distilled under a vacuum. The specific electrical resistance ... that of copper and calcium. ... the temperature of liquid helium. ... Faraday method. This did not depend on the magnetic ... decreasing as the temperature rose. ... appearance of one electron in the 3d-shell alters the physical ... in comparison with the other metals. Orig. art. has: 7 figures.

ASSOCIATION: None

SUBMITTED: 13Jun64 ENCL: 00 SUB CODE: MM, EM

NO REF SOV: 002 OTHER: 012

Card 3/3

AP4042806 S/0126/64/018/001/0026/0030

Fedorov,

... dependence of the Hall effect in gadolinium ...

Fizika metallov i metallovedeniye, v. 18, no. 1, 1964, 26-30

... effect, temperature dependence, scattering, magnetization, resistivity

ABSTRACT: The authors investigate the temperature dependence in the spontaneous ... which has not been clarified as yet despite numerous papers on the ... two mechanisms of scattering ... the scattering on phonons and the scattering ... At ... the scattering on impurities may ... electrical ...

Card 1/2

L 15751-65
ACCESSION NR: AP4042806

compared with theoretical calculations of the temperature dependence of the spontaneous Hall coefficient. The authors contend that near the ... dence is determined by the ...

... temperature-depen...

... experimental data it may be concluded that ...

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of the Physics of Metals, AN SSSR)

SUBMITTED: 10Mar64 ENCL: 00

SUB CODE: MM NO REF SOV: 008 OTHER: 008

Card 2/2

PALATNIK, L.S.; FEDOROV, G.V.; BOGATOV, P.N.

Processes of vaporization and volume condensation of alloys. Dokl. AN SSSR 158 no.3:586-589 S '64. (MIRA 17:10)

1. Khar'kovskiy politekhnicheskiy institut im. V.I.Lenina. Predstavleno akademikom S.A.Vekshinskim.

L 00735-66 EWP(e)/EWT(m)/EWP(k)/EWP(t)/EWP(z)/EWP(b) IJP(c) JD

ACCESSION NR: AP5022699 UR/0181/65/007/009/2648/2654

50
47
B

AUTHOR: Palatnik, L. S.; Fedorov, G. V.; Bogatov, P. N.
44,55 44,55 44,55

TITLE: Some characteristics of volume condensation of metals and alloys

SOURCE: Fizika tverdogo tela, v. 7, no. 9, 1965, 2648-2654

TOPIC TAGS: powder metal production, lead, antimony, bismuth, vapor condensation
44,55 18 27 27 27

ABSTRACT: When metal is vaporized in a high vacuum where the mean free path is greater than the dimensions of the vacuum equipment, metal vapor condenses in a solid film on the walls. The mean free path of the metal atoms can be reduced by increasing the density of the residual gas. The metal atoms then gradually lose their excess energy through collisions with atoms of inert gas, and are thrown into Brownian movement. When these atoms are sufficiently concentrated, volume condensation takes place, forming an exceptionally fine metal powder. The process of volume condensation of metal vapor may be divided into two stages: 1) the formation of nucleating centers for condensation; 2) growth of these nuclei in the supersaturated vapor. The second stage of the volume condensation process is quite similar to surface condensation of metals, therefore it may be assumed that the general characteristics of metal condensation on a substrate are also true in vol-

L 00735-66

ACCESSION NR: AP5022699

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ume concentration. The authors study some of the characteristics of volume condensation of pure metals and alloys in an inert gas atmosphere (argon). Volume condensation of lead showed a variation in the shape and size of the particles with temperature. When the condensation temperature was 80°C, the particles are well-defined faceted crystals with dimensions of 200-300 Å. At 140°C, there is a mixture of faceted and spherical particles with sizes of 0.1-0.2 μ. At 240°C, the particles are only spherical and measure 0.3-0.5 μ. X-ray analysis shows that the particles are single crystals at 80° and polycrystalline above 80°. This change in the structure and shape of the particles is explained by a change in the condensation mechanism. The two condensation mechanisms are: vapor → crystal; and vapor → → liquid (→ crystal). Antimony begins to vaporize at a temperature 100-150°C below the melting point. The particles are rhombic in form and their dimensions increase sharply with temperature. These particles are single crystals which indicates that only the first condensation mechanism (vapor → crystal) operates in the case of antimony. Apparently the triple point lies at a very high vapor pressure, which was not reached in these experiments. Volume condensation of Pb-Sb alloys gives a mechanical mixture of particles of the components. Condensation of a Bi--Sb alloy gives two types of particles. Some particles are a solid solution of antimony in bismuth while others are a solid solution of bismuth in antimony. A

ACCESSION NR: AP5022699 3

similar situation was observed in the Pb-Bi system. A theoretical explanation is given for the experimental data. Orig. art. has: 7 figures.

ASSOCIATION: Khar'kovskiy politekhnicheskiy institut im. V. I. Lenina (Kharkov Polytechnical Institute) 44,55

SUBMITTED: 06Mar65 ENCL: 00 SUB CODE: MM, SS

NO REF SOV: 013 OTHER: 005

Card 3/3

L 5401-66 EWT(1)/EWT(m)/EWP(t)/EWP(b) IJP(c) JD/JG

ACC NR: AP5027396 SOURCE CODE: UR/0181/65/007/011/3213/3217

53
52
B

AUTHOR: Volkenshteyn, N. V.; ~~Fedorov, G. V.~~

55 44 55 44

ORG: Institute of Physics of Metals, AN SSSR, Sverdlovsk (Institut fiziki metallov AN SSSR)

55 44

TITLE: The Hall effect in neodymium and samarium

21,44,55 27 55, 27

SOURCE: Fizika tverdogo tela, v. 7, no. 11, 1965, 3213-3217

TOPIC TAGS: samarium, neodynium, lanthanide series, Hall effect

ABSTRACT: Data are given from measurements of the Hall effect in neodymium and samarium of ~99.9% purity at temperatures from 2.4 to 350°K. The Hall effect in Nd is positive throughout this temperature interval. The specific Hall emf is a linear function of induction in the Nd specimen above 20.4°K. Curves for $e_H(B)$ have a poorly defined inflection at 20.4°K which shows up more clearly when the temperature is reduced. The $e_H(B)$ curves for 4.2 and 2.4°K show two inflections: one at ~6-7 kilogauss corresponding to the critical range of the magnetic field which destroys antiferromagnetism, and a second at ~18-20 kilogauss due to ferro-

Card 1/2 0901 1324

L 5401-66

ACC NR: AP5027396

magnetic saturation. The Hall emf in Nd is only slightly dependent on temperature in the 100-300°K range. There is a noticeable inflection at ~60-70°K although no change is observed in the magnetic structure of the specimen. As the temperature approaches the Néel point, e_H increases sharply and then diminishes at lower temperatures. However, the maximum e_H is not at the Néel point but at 7-8°K, i. e., at the temperature for interchange of magnetic planes. The Hall effect is negative at high temperatures in Sm, changing sign at ~170°K. Contrary to other lanthanons, the Hall effect in Sm is considerably dependent on temperature in the paramagnetic region. Hall emf in this element is a linear function of induction with only a slight inflection in the $e_H(B)$ curve at 4.2°K. The maximum effective Hall coefficient in Sm is reached at a temperature of ~17°K, i.e., somewhat higher than the Néel point. These results are compared with the field and temperature relationships of the Hall effect in the heavy lanthanons. It is concluded that the field and temperature singularities with respect to the Hall effect in lanthanons is due to the unusual magnetic structure of these elements. Recommendation is made for a study of anisotropy in the Hall effect in lanthanon single crystals. Orig. art. has: 5 figures.

14

SUB CODE: SS/ SUBM DATE: 03May65/ ORIG REF: 005/ OTH REF: 010

BVK

Card 2/2

L 53061-65 EWT(d)/EWT(l)/EWT(m)/EPF(c)/EEC(k)-2 [illegible]

L 53961-65
ACCESSION NR: AP5011758

the Hall effect in pure nickel ($\rho_{293}/\rho_{4.2}$ = 280) in the 57.5-120°K range The spontaneous Hall coefficient is found from the formula $eX(B) = R_0^*B + 4\pi M(H,T)$

where ... is the Hall emf per unit of current density; B is the induction in the specimen; $M(H, T)$ is the magnetization intensity in a given magnetic field at a given temperature; R_0^* is the effective normal Hall coefficient. The linear ... curve $eX(B)$ above saturation induction, obtained by averaging 3-4 series of measurements at a given temperature, was approximated by an equation ... using the method of least squares ... equation and the spontaneous Hall coefficient ... was found from ... from the formula $R_s = e_X(0)/4\pi M_s(0, T)$, where $M_s(0, T)$ is the spontaneous magnetization at the measurement temperature. The curve for R_s as a ... of the Enclosure) was plotted from ...

... calculations in the ... formulas.

Card 2/...

L 53961-65
ACCESSION NR: AP5011758

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals AN SSSR)

SUBMITTED: 13Jul64 ENCL: 01 SUB CODE: EM

NO REF SOV: 003 OTHER: 002

Card 3/4

L 53961-65
ACCESSION NR: AP5011756

ENCLOSURE: 01

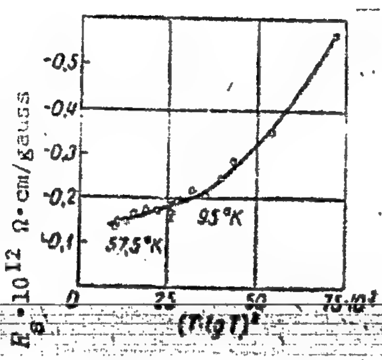

Fig. 1.

Card 4/4

L 8086-66 EWT(m)/ETC/EWG(m)/EWP(t)/EWP(b) IJP(c) RDW/JD

ACC NR: AP5027133 SOURCE CODE: UR/0126/65/020/004/0508/0511

AUTHOR: Volkenshteyn, N. V.; Fedorov, G. V.

ORG: Institute for the Physics of Metals AN SSSR (Institut fiziki metallov AN SSSR)

TITLE: The Hall effect in terbium and thulium

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 4, 1965, 508-511

TOPIC TAGS: Hall effect, terbium thulium, rare earth metal

ABSTRACT: The article is a continuation of previous work by the authors on the Hall effect in rare earth metals. Measurements were made in the temperature interval from 4.2 to 350°K for terbium and 4.2 to 294°K for thulium. The spontaneous, R_s, and conventional effective, R_o*, Hall coefficients were calculated for terbium in the ferromagnetic region, by methods described in a previous article. In the paramagnetic region, R_s' and the usual Hall coefficient, R_o, were calculated from the relationship $R_o^* = R_o + R_s'Z$, where $Z = 4\pi C/(T - \Theta + 4\pi C)$, $R_o^* = e_x/B$; this was done graphically in the region where this relationship gives a straight line. R_s' and R_o for thulium in the paramagnetic region were calculated in the same way. The terbium had a purity of 99.9% and a ratio $\rho_{300°K}/\rho_{4.2°K} = 18.8$. The experimental

Card 1/2

UDC: 539.292:538.63

L 8086-66

ACC NR: AP5027133

2

data is shown graphically. In the paramagnetic region, R_s^* and R_o are negative and constant in magnitude up to approximately 275°K. At lower temperatures and near the paramagnetic-antiferromagnetic transition point, R_s' decreases sharply, while R_o increases in absolute value. In the ferromagnetic region, R_s changes sign twice; in the same region, R_o^* changes sign once, but in absolute value is equal to R_s. The thulium had a purity of 99.9% and a ratio $\rho_{293°K}/\rho_{4.2°K} = 7.4$. In the paramagnetic region, e_x for thulium depends linearly on the induction in the sample. At lower temperatures and near the paramagnetic - antiferromagnetic transition point, R_o^* rises sharply. Below this temperature the curves of the function $e_x(B)$ take on the form characteristic of ferromagnetics but, at induction values of about 20 kilogauses, there is a break in the curves and a more rapid increase in $e_x(B)$, particularly marked at 20.4 and 4.2°K. This break corresponds to the sharp rise in the magnetization of thulium in fields of about 16 to 18 kilogauss at temperatures below approximately 50°K. Graphic calculation gives for thulium, in the paramagnetic region, a value of $R_o = -2.35 \times 10^{-12}$ ohm-cm/gauss, which corresponds to 0.8 el/atom. These data agree well with earlier published values. Orig. art. has: 5 figures.

SUB CODE: MM,EM/ SUBM DATE: 26Oct64/ ORIG REF: 006/ OTH REF: 011

nw

Card 2/2

L 8916-66 EWT(m)/EWP(w)/T/EWP(t)/EWG(h) IJP(c) JD

ACC NR: AP5027144 UR/0126/65/020/004/0574/0578

53
B

AUTHOR: Palatnik, L. S.; Fedorov, G. V.; Prokhvatilov, A. I.; Fedorenko, A. I.
44,55 44,55 44,55 44,55

ORG: Khar'kov Polytechnic Institute im. V. I. Lenin (Khar'kovskiy politekhnicheskiy institut) 44,55

TITLE: Mechanical properties of vacuum condensates of aluminum
44,55, 18 44,55 27

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 4, 1965, 574-578

TOPIC TAGS: aluminum, condensation reaction, vacuum sublimation

ABSTRACT: The article is devoted to a study of aluminum vacuum condensates obtained by vaporization of the metal from crucibles made of alundum and beryllium oxide. Aluminum and its alloys were vaporized in a vacuum of 10^{-5} mm Hg. The condensates were formed on polished and carefully cleaned open steel rings, located coaxially with the crucible at a distance of 80 mm. A temperature gradient of 50-550°C was created by heating one end of the ring and cooling the other. The thickness of the condensate film was approximately 40 microns. Vaporization of aluminum from alundum

Card 1/2 UDC: 539.23 + 546.261

L 8916-66

ACC NR: AP5027144

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crucibles at 1200°C was accompanied by the reaction of the material of the crucible with the molten aluminum. At the end of 3-4 hours there was formed a solid solution 1.5 mm thick on the walls of the crucible. In this, the amount of the alloying aluminum oxide was evaluated at from 8 to 10%. It was found that at a condensation temperature greater than 450°, the aluminum oxide in the condensate is formed in the crystalline state of gamma aluminum oxide; at lower temperatures, in an amorphous or subdispersed state. Aluminum oxide increases considerably the microhardness of the aluminum condensate (up to 330 kg/mm^2). Annealing at 230-490° has the opposite effect. Samples condensed at temperatures of 450-520° do not recrystallize during annealing. Condensates of a multi-component alloy of aluminum, copper, magnesium, manganese, silicon, and iron, based on aluminum reinforced with aluminum oxide, have considerable strength (50-60 kg/mm^2) and greater ductility than condensates of aluminum obtained under analogous conditions. Orig. art. has: 1 formula, 3 figures and 1 table.

SUB CODE: MM/ SUBM DATE: 24Jul64/ ORIG REF: 011/

OTH REF: 002

PC

Card 2/2

VOLKENSHTEYN, N.V.; FEDOROV, G.V.

Hall effect in terbium and thullium. Fiz. met. i metalloved. 20 no.4:508-511 O '65. (MIRA 18:11)

1. Institut fiziki metallov AN SSSR.

L 17550-66 EWT(m)/EWP(t) JD
ACC NR: AP6003758 SOURCE CODE: UR/0181/66/008/001/0036/0040
46
45
B

AUTHORS: Palatnik, L. S.; Fedorov, G. V.; Bogatov, P. N.

ORG: Khar'kov Polytechnic Institute im. V. I. Lenin (Khar'kovskiy politekhnicheskiy institut)

TITLE: Investigation of the mechanism of volume condensation of Cd, Zn, and Mg

SOURCE: Fizika tverdogo tela, v. 8, no. 1, 1966, 36-40

TOPIC TAGS: cadmium, zinc, magnesium, metal vapor deposition, vapor condensation, vapor pressure

ABSTRACT: The authors investigated the mechanism of volume condensation of Cd, Mg, and Zn in an atmosphere of an inert gas. The experimental procedure was essentially the same as in an earlier investigation (FTT v. 7, 2648, 1965). The condensates were examined with an optical microscope and an electron microscope (Em-3, resolution 100 Å), and also by x-ray analysis. The results show that, unlike earlier investigations by one of the authors (Palatnik, with N. T. Gladkikh

Card 1/2

L 17550-66

ACC NR: AP6003758

FTT v. 4, 222, 1962), where the condensation occurred directly from the vapor phase to the crystal phase, in the present studies, where the metal was evaporated by means of an arc and then condensed, the condensation proceeded via an intermediate liquid stage. The difference in the results is attributed to the fact that with increasing vapor density the critical temperature of the condensation increases, and since magnesium, cadmium, and zinc have very high vapor tensions, the critical condensation temperatures increase so much that it can exceed the melting temperature. This gives rise to a high degree of supersaturation, causing the condensation to proceed via the liquid stage. The results confirm once more that whether a metal condenses via the liquid stage or directly from the vapor stage depends not only on the type of metal, but also on the condensation conditions. Orig. art. has: 2 figures.

SUB CODE: 11 SUBM DATE: 24Jun65/ ORIG REF: 007/ OTH REF: 002

Card 2/2 nst

L 28858-66 EPF(n)-2/EWT(m)/ETC(f)/EWG(m)/T/EWP(e)/EWP(t)/ETI IJP(c) WH/DS/WW/

ACC NR: AP6010408 JW/JD/JG SOURCE CODE: UR/0126/66/021/003/0409/0413

AUTHOR: Palatnik, L. S.; Fedorov, G. V.; Bogatov, P. N.

ORG: Khar'kov Polytechnic Institute im. V. I. Lenin (Khar'kovskiy politekhnicheskiy institut)

TITLE: Patterns of evaporation of alloys

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 3, 1966, 409-413

TOPIC TAGS: evaporation, lead containing alloy, cadmium containing alloy, zinc, bismuth, magnesium, argon, temperature dependence, vapor condensation, vapor pressure

ABSTRACT: The investigation of these patterns in the presence of inert atmospheres is of interest in connection with the research into the processes of the volume condensation of metals. Pb-Bi, Pb-Sb, Zn-Cd, and Mg-Cd alloys were accordingly evaporated in a vacuum apparatus which was evacuated to a pressure of $1 \cdot 10^{-3}$ mm Hg, washed with argon and then evacuated to the specified pressure of argon (0.1-10 mm Hg). The metals were evaporated from alundum crucibles with the aid of tunsten or nichrome heaters. The resulting powdery condensates were investigated by methods of spectral and x-ray phase analysis. For uniform evaporation during spectral analysis the powdery condensate was mixed with graphite powder (1:4); the mixture was evaporated from a cylindrical recess in a graphite electrode, Pb-Sb and Pb-Bi alloys were evaporated at

Card 1/3

UDC: 536.422:669.018

L 28858-66

ACC NR: AP6010408

T_{ev} of from 800 to 1300°C, condensation temperature T_c = 80°C and argon pressure p = 3 mm Hg. Findings: at T_{ev} = 800°C a marked selective evaporation of Sb takes place, since the vapor pressure of Sb is roughly 3.5 times as high as that of Pb. With increasing T_{ev}, however, the Pb content of the condensates increases and for T_{ev} ≥ 1200°C the composition of the condensate is identical with that of the initial alloy. The same pattern of evaporation is observed for alloys of the Pb-Bi system, where also Pb is the less volatile component; in this case too the evaporation rates of the components of the Pb-Bi alloys become equalized when T_{ev} ≥ 1200°C. Zn-Cd alloys were evaporated at argon pressure 10 mm Hg, T_c = 80°C and T_{ev} = 400-900°C, and Mg-Cd alloys, at p_{Ar} = 10 mm Hg, T_c = 80°C and T_{ev} = 500-1000°C. In both alloy systems Cd is the more volatile component and thus is the first to evaporate. The vapor pressure of Cd is 13 times higher than that of Zn (at 400°C) and the content of the less volatile component (Zn) increases with increasing T_{ev}. Hence the temperature at which the composition of the condensate is the same as that of the initial alloy can be estimated (by extrapolation) at 1500±100°C for Zn-Cd. By analogy, for Cd-Mg (p_{Cd}/p_{Mg} = 170) we extrapolate $T_{ev.cond.}$ = 2200±200°C. These experiments give reason to believe that the greater is the difference in the vapor pressures of alloy components the higher is the evaporation temperature of condensate $T_{ev.cond.}$ at which the condensate's composition approaches that of the initial alloy and the evaporation rates of both components become the same. Thus, T_{ev} markedly affects the composition

Card 2/3

L 28858-66

ACC NR: AP6010408

of volume condensates. At relatively low T_{ev} of alloys containing components with sharply different vapor pressures, their condensates differ considerably in composition from the initial alloys; as T_{ev} increases, this difference diminishes. Orig. art. has: 6 figures, 1 table.

SUB CODE: 11, 20/ SUBM DATE: 27Apr65/ ORIG REF: 008/ OTH REF: 001

Card 3/3

L 40956-66 EWT(m)/EWP(k)/EWP(e)/EWP(t)/ETI IJP(c) JH/JG/WW/JD

ACC NR: AT6024930

SOURCE CODE: UR/2981/66/000/004/0202/0207

AUTHOR: Palatnik, L. S.; Fedorov, G. V.; Klyagina, N. S.; Krivenko, R. A.; D'yachenko, S. S.; Fridlyander, I. N. (Doctor of technical sciences)

ORG: none

52

B+1

TITLE: Obtaining highly dispersed metal powders by vaporization in argon

SOURCE: Alyuminiyevyye splavy, no. 4, 1966. Zharoprochnyye i vysokoprochnyye splavy (Heat-resistant and high-strength alloys), 202-207

TOPIC TAGS: metal powder, ultra fine powder, powder metal production, VAPOR CONDENSATION, ALUMINUM POWDER

ABSTRACT: Certain processes associated with the condensation of metal vapors in an inert-gas atmosphere have been investigated. It was found that in the argon atmosphere, condensation of metal vapors takes place in a limited space-condensation zone. The size of the condensation zone decreases with increasing vaporization rate and inert-gas pressure. On an experimental scale, ultrafine powders of several metals were obtained. The magnesium, cadmium, and zinc powders had an average particle size of 0.001 mm; the particle size of copper and aluminum powders was 0.00005. The size of copper and aluminum particles does not depend very greatly on the variation in the rate of vaporization and the pressure of inert gas. Orig. art. has: 7 figures. [TD]

SUB CODE: 11 / SUBM DATE: none/ ORIG REF: 004/ ATD PRESS: 5057

Card 1/1 hs

Card 1/2

UDC: 669.31.71:536.423.1

ACC NR: AP6032618

was measured on the DRON-1 unit. It was shown that the physico-mechanical properties of the condensates are a function both of block recrystallization and of variations in relaxation of the crystal substructure. Orig. art. has: 2 figures.

SUB CODE: 11, 07/ SUBM DATE: 23Feb66/ ORIG REF: 009/ OTH REF: 004

Card 2/2

L 41737-66 EWT(1)/EWT(m)/T/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6020204 SOURCE CODE: UR/0056/66/050/006/1505/1509

59
55
B

AUTHOR: Volkenshteyn, N. V.; Grigorova, I. K.; Fedorov, G. V.

ORG: Institute of Physics of Metals, Academy of Sciences, SSSR (Institut fiziki metallov Akademii nauk SSSR)

TITLE: On the anisotropy of the Hall effect in gadolinium 27

SOURCE: Zh eksper i teor fiz, v. 50, no. 6, 1966, 1505-1509

TOPIC TAGS: gadolinium, Hall effect, magnetic anisotropy, rare earth metal, magnetic structure, temperature dependence

ABSTRACT: To obtain additional information on the magnetic anisotropy of rare-earth metals, the authors investigated the Hall effect in single-crystal samples of gadolinium ($\rho(292K)/\rho(4.2K) = 20$) in the temperature interval 4.2 - 370K. The measurements were made with crystals cut in two mutually perpendicular directions. In the first the primary current was directed along the a_0 axis and the magnetic field along the c_0 axis, and the Hall field was measured in the b_0 direction. For the second sample the primary current was along a_0, the magnetic field along b_0, and the Hall field along c_0. The authors have published elsewhere the procedure used to measure the Hall emf (FMM v. 2, 377, 1956) and the data reduction procedure (FMM v. 18, 26, 1964). The dependence of the Hall effect on the field in gadolinium exhibits noticeable anisotropy. The Hall emf at temperatures below the Curie point depends on the induction in the sample linearly, but the temperature at which the linearity begins

Card 1/2

L 09684-67 EWT(l)/EWT(m)/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6032474 SOURCE CODE: UR/0056/66/051/003/0780/0785

37

AUTHOR: Volkenshteyn, N. V.; Grigorova, I. K.; Fedorov, G. V.

ORG: Metal Physics Institute, Academy of Sciences SSSR (Institut fiziki metallov Akademii nauk SSSR)

TITLE: Anisotropy of the Hall effect in dysprosium

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 3, 1966, 780-785

TOPIC TAGS: Hall effect, dysprosium,dysprosium single crystal, anisotropy, dysprosium anisotropy

ABSTRACT: The Hall effect is measured in single crystals of dysprosium (ρ(294K)/ρ(4.2K) = 10) at temperatures between 4.2 and 350K. An anisotropy of the field and temperature dependence of the Hall emf is found in the temperature range of existence of the magnetic ordered structure. An anisotropy of the Hall coefficient above the Neel temperature has also been observed. Orig. art. has: 5 figures. [Authors' abstract]

SUB CODE: 20/ SUBM DATE: 22Apr66/ ORIG REF: 007/ OTH REF: 007

Card 1/1 <illegible>

TVERSKOY, P.N.; MILIN, V.B.; FEDOROV, G.Ye.

Studying the vertical intensity profile of the electric field in the lower atmosphere. Vest. LGU 8 no.5:83-90 My '53.
(MIRA 12:7)

(Atmospheric electricity)

SOV/124-57-5-5774

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 5, p 105 (USSR)

AUTHOR: Fedorov, G. Ye.

TITLE: The Effect of Turbulent Mixing on the Potential Gradient of the Electrical Field of the Atmospheric Surface Layer (Vliyaniye turbulentnogo peremeshivaniya na napryazhennost' elektricheskogo polya v prizemnom sloye atmosfery)

PERIODICAL: Uch. zap. Kirovskogo gos. ped. in-ta, 1954, Vol 1, Nr 8, pp 61-66

ABSTRACT: A description is given of the results obtained from experiments conducted by the author in the summer of 1952 for the investigation of the relationships existing between the profile of the vertical potential gradient of the electrical field and the degree of turbulent mixing in the atmospheric surface layer. A series of observations (43 in all) were carried out, consisting of the potential gradient measurements at levels of 1, 3, 5, 7, and 10 meters, polar-conductivity measurements at the 1-m level, and observations of the gradient according to which the eddy-diffusivity coefficient at the 1-m level was calculated. Very close agreement was discovered between the values of

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SOV/124-57-5-5774

The Effect of Turbulent Mixing on the Potential Gradient of the Electrical (cont.)

the vertical-potential profile obtained by the measurements and those calculated according to the theoretical formula of V. B. Milin (RZhMekh, 1954, abstract 3377). It is shown that the character of the potential-gradient profile varies in accordance with the variation in the degree of turbulent mixing. Moreover, with an increase in turbulent exchange there is a regular decrease of the absolute values of the potential gradient of the electrical field of the atmospheric surface layer. The results are illustrated by the inclusion of 7 nomograms. Bibliography: 8 references.

L. S. Gandin

Card 2/2

FEDOROV, G.Ye., inzhener.

Mechanical blocking of circuit breakers with PS-10 drive and disconnectors with PR-1 drive. Energetik 5 no.6:21-22 Je '57. (MIRA 10:7)

(Electric cutouts)

SOV/169-59-7-7159

Translation from: Referativnyy zhurnal, Geofizika, 1959, Nr 7, p 100 (USSR)

AUTHOR: Fedorov, G.Ye.

TITLE: The Experience of Measuring the Conductivity of Air Near the Earth Surface in Summer Time

PERIODICAL: Uch. zap. Kirovskiy gos. ped. in-t, 1958, Nr 15, pp 66 - 72

ABSTRACT: The author expounds the results of measuring the conductivity of air at altitudes of 0, 1, 2, 3m above the earth surface with two Gerdien devices. The duration of exposition in measuring one polar conductivity varies in dependence on the atmosphere conditions: when cloudiness exists, the conductivity increases with the altitudes; when the cloudiness decreases and the wind increases, the conductivity drops. When the weather was cloudless and windless, a sharp increase of conductivity at an altitude of 1 m is observed. Basing on the comparison of the results of measuring the conductivity with the density of light ions at the

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SOV/169-59-7-7159

The Experience of Measuring the Conductivity of Air Near the Earth Surface in Summer Time

same altitudes, the author draws the conclusion that the obtained experimental data indicate in the main correctly the variation of the conductivity with the altitude.

N.V. Krasnogorskaya

Card 2/2

FEDOROV, I.

Water tanks built of bricks and clay. Sel'. stroi. 9 no.5:12 Ag '54. (MIRA 13:2)

1. Nachal'nik otdela po stroitel'stvu v kolkhozakh Peskovskogo rayona Balashovskoy oblasti.

(Tanks)

22(1)

SOV/27-59-4-10/28

AUTHORS: Fedorov, I., Chief Technologist, and Sidorkin, V., Deputy School Director

TITLE: A Training Ground for the Overhead Network System

PERIODICAL: Professional'no-tekhnicheskoye obrazovaniye, 1959, Nr 4, pp 15-16 (USSR)

ABSTRACT: During the beginning 7-Year Plan, huge main lines will have to be electrified. The problem of expanding the training of electricians by the system of State Labor Reserves is, therefore, one of special significance. The author points out the difficulty of organizing the practical training of overhead network electricians which primarily takes place on the electrical installation trains of the Vsesoyuznyy montazhnyy trest elektrifikatsii zheleznodorozhnogo transporta (All-Union Installation Trust for the Electrification of Railroads). The present curricula, composed by the Glavnoye upravleniye trudovykh rezervov (Main Administration of Labor Reserves), provide that practical training in the 2nd class take place every other day, which complicates

Card 1/2

SOV/27-59-4-10/28

A Training Ground for the Overhead Network System

training. Moreover, the electrical installation trains perform their work at great distance from the school, which means sending the students away for several months on practical training. This, and other difficulties, prompted the schools to establish special training grounds with an overhead network. The "Transelektromontazh" Trust in cooperation with the Zheleznodorozhnoye uchilishche Nr 6 Moskovskoy oblasti (Railroad School Nr 6 of the Moscow Oblast') have planned a standard training ground for overhead networks. It was built by the school and serves for carrying out practical exercises on the basic themes of industrial training. Such a ground can be erected by every school at a minimum cost. The article contains a plan of the training ground and a specification of the anchor sections. There are 2 tables and 1 diagram

ASSOCIATION: Trest "Transelektromontazh" ("Transelektromontazh" Trust), Zheleznodorozhnoye uchilishche Nr 6 (Moskovskaya oblast') (Railroad School Nr 6 - Moscow Oblast').

Card 2/2

FEDOROV, I.

[redacted]

A useful manual ("The study of machines in grades 8-10 of the urban secondary school" by M.A.Zhidelev. Reviewed by I.Fedorov). Politekh.obuch. no.8:87-89 Ag '57. (MIRA 10:9)

1. Prepodavatel' mashinovedeniya sredney shkoly No.80, Novosibirsk.
(Mechanical engineering--Study and teaching) (Zhidelev, M.A.)

FEDOROV, I.

Packings for the heat exchanger for the solution of monoethanolamine. Khol.tekh. 35 no.5:62 S-O '58. (MIRA 11:11)
(Heat regenerators) (Packing (Mechanical engineering))

FEDOROV, I. and NIKITIN, N.

"BAIR 5P", published by the State Publishing House for Geographical Literature, in Moscow 1953.

SO: TABCON, sum. of context, D-83950, 6 Oct 1954.

KHOKHLOV, A., dotsent; NAUCHIGIN, D., vetvrach; FEDOROV, I., rentgenotekhnik

Roentgenoscopic control of meat products. Mias.ind.SSSR 31 no.5:29-30 '60. (MIRA 13:9)

1. Leningradskiy veterinarnyy institut (for Khokhlov).
2. Leningradskiy myasokombinat (for Fedorov).

(Meat inspection)

FEDOROV, I.

Stretch to strengthen. Znan. sila 37 no.1:20-22 Ja '62.
(MIRA 15:1)

(Prestressed concrete construction)

FEDOROV, I.

"Stone" machine tools. Znan.-sila 37 no.6:9-11 Je '62. (MIRA 15:9)

(Machinery industry) (Reinforced concrete construction)

FEDOROV, I.A.

Selvage catching device with photoelectric control. Tekst.prom. 14 no.8:53-54 Ag '54. (MLRA 7:10)
(Textile machinery)

CA

6

Compounds of rhodium with acetonitrile. V. V. Lebedinskii and I. A. Fedorov. Ann. sect. Platine (U. S. S. R.) No. [illegible]. Na_3RhCl_6 reacts with MeCN in the presence of NH_4Cl to give $(NH_4)_2(RhCH_3CNCl_5).H_2O$. Further replacement of Cl by MeCN does not occur. The K salt of this compd. is sol. in H_2O; the Rb, Cs, Ag and $[Pt(NH_3)_4]^{++}$ salts are almost insol.

H. M. Leicester

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

BC

2-1

New compounds of (A) rhodium, (B) iridium, with [illegible]. V. V. L[illegible] and I. A. F[illegible] (Ann. Sect. Platine, 19[illegible], No. 15, [illegible]—(A) [illegible] (I), and aq. $Na_3[Rh(NO_2)_6]$ are [illegible] for [illegible] excess of NH_4Cl [illegible] (R = [illegible]) [illegible]. The corresponding guanidine and $[Pt(NH_3)_4]$ salts are described.

(B) [illegible] and (I) yield the acid $H[IrR_2Cl_2]$ [illegible] ($+H_2O$), guanidine, K ($+2H_2O$) and $[Pt(NH_3)_4]$ salts are described.

R. T.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Compounds of iridium with dimethylglyoxime. III. Nitrodimethylglyoxime compounds. V. V. Lebedinskii and I. A. Fedorov. *Ann. secteur platine, Inst. chim. gén.* (U.S.S.R.) 18, 21-30(1945)(in Russian); cf. *ibid.* 17, 81(1940); C.A. 35, 2806[6]. —(1) $K_3[Ir(NO_2)_6]$, 3.5 g. in 200 ml. water, was boiled for 20 hrs. with 3 g. dimethylglyoxime (DH_2) added in 3-4 portions until almost completely dissolved (dark-red soln.); after cooling, the soln. was filtered, boiled down to $^1/_3$ its vol., and filtered again; dropwise addn. of concd. HCl, with cooling and stirring, resulted in a yellow ppt. consisting of tapering rodlets; the ppt. was washed with HCl 1:1, then with alc.; yield 1-1.2 g. Drying at 100° resulted in increasing loss of wt. (decompn.) and darkening; there was no loss of wt. in drying over concd. H_2SO_4; this indicates absence of crystn. water. Analysis gave $H[Ir(DH)_2(NO_2)_2]$, *hydrogen bis(dimethylglyoximo)dinitroiridate (III)*. Molar elec. cond. μ = 311.80, 314.50, 307.32 at 25°, at dilns. v = 500, 2000, 8000, resp. (2) The acid dissolves in NH_4OH with a green color; the salt, $NH_4[Ir(DH)_2(NO_2)_2].2H_2O$, is pptd. by NH_4Cl, washed with satd. NH_4Cl, then with alc.; yellow-green square prisms and tablets; at 25°, μ = 111.37, 116.40, 122.70, at v = 500, 2000, 8000, resp., corroborating the formula. (3) On addn. of more HCl to the filtrate of (1) and evapn. to a small vol., an orange-red ppt. is obtained, brown-red after drying, permitting heating to 110-15° without change of wt.; analysis gives $H[Ir(DH)_2Cl(NO_2)]$, *hydrogen chlorobis(dimethylglyoximo)nitroiridate (III)*, rhombic crystallites. (4) Boiling of 2 g. of (1) for 3-4 hrs. with 2 g. NH_4CNS in 150 ml. (const. vol.), followed by evapn. to $^1/_4$ of the vol. and pptn. with concd. HCl in the cold, gave $H[Ir(DH)_2(NO_2)(NCS)]$, *hydrogen bis(dimethylglyoximo)nitro(thiocyanato)iridate (III)*, round or square crystallites, green in transmitted and red in reflected light, markedly sol. in alc. (5) Boiling of 0.6 g. of (2) with 0.2 g. of $CS(NH_2)_2$ for 1 hr. left the original salt unchanged; no substitution by thiourea took place. No substitution of NO_2 occurred on boiling (1) with $NH_2CH_2CH_2NH_2$. (6) On the basis of the partial mobility of one NO_2 group and nonsubstitution of $2NO_2$, it is submitted that, in $[Ir(DH)_2(NO_2)_2]$, the two NO_2 groups are in cis positions with respect to each other and are oriented towards different branches of the DH; the more mobile NO_2 group may be in a trans position with respect to the :NO branch of DH, the trans influence of which is greater than that of :NOH. This is contrasted with the case of $[Ir(DH)_2Cl_2]$, where the observed equal, and very slight, mobility of the two cis-Cl calls for their identical orientation towards the branches of DH. **IV. Ammoniacal dimethylglyoxime compounds.** *Ibid.* 31-7.—(1) Heating of 1 g. $[Ir(NH_3)_5Cl]Cl_2$ with 1.0-1.2 g. DH_2, 1.5 g. NH_4OAc, and 30 ml. water in a sealed tube at 130° for 10-12 hrs. results in an orange-red soln.; after cooling, filtration, and evapn. to $^1/_3$ the initial vol., addn. of KI gives a ppt. of green-yellow rectangular crystals: $[Ir(NH_3)_5Cl]I_2$. A second ppt., formed from the filtrate after 2-3 min., recrystd. 2-3 times, green needles, had the compn. $[Ir(DH)_2(NH_3)_2]I.^1/_2H_2O$, *diammine bis(dimethylglyoximo)iridium (III) iodide*, corroborated by elec. cond. at 25°, μ = 90.22, 92.02, at v = 1000, 2000, yield 0.3 g. (2) From the soln. of 0.3 g. of (1), Na picrate ppts. 0.2 g. $[Ir(DH)_2(NH_3)_2]OC_6H_2(NO_2)_3.H_2O$, long, thin needles. (3) Boiling of 0.5 g. of (1) with 0.6 g. $CS(NH_2)_2$ (Th) in 20 ml. for 10-15 min., evapn. to $^1/_3$ of the vol., and cooling, gave 0.4 g. of a ppt. $[Ir(DH)_2(Th)_2]I$. No substitution of NH_3 was obtained by boiling with $NH_2CH_2CH_2NH_2$. (4) Boiling of 1.5 g. of (1) for 1 hr. with 20-30 ml. 1:1 HCl, at const. vol., and evapn. to $^1/_3$ the vol., gave on cooling 0.2 g. of a ppt. consisting of yellow needles and octahedra, similar to $H[Ir(DH)_2Cl_2]$ but not identical with it, being much more sol. in water; the product appears to be a heterogeneous mixt. (5) The reactions demonstrate a higher degree of lability of the NH_3 in $[Ir(DH)_2(NH_3)_2]$ as compared with that of Cl in $[Ir(DH)_2Cl_2]$. It is concluded that the two NH_3 are in cis positions relative to each other and in trans positions relative to the :NO branches of DH. N. Thon

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CA

Compound of rhodium with dimethylglyoxime. V. V. Lebedinskii and I. A. Fedorov. *Izvest. Sektora Platiny i Drugikh Blagorod. Metal., Inst. Obshchei i Neorg. Khim., Akad. Nauk S.S.S.R.* No. 21, 157-63(1948).—When $NH_4[Rh(dmg)_2Cl_2]$ (dmg is the dimethylglyoxime radical) soln. was boiled with NH_4I for 1-1.5 hrs. the product was $NH_4[Rh(dmg)_2ClI]\cdot 0.5H_2O$; with NH_4Br the product $NH_4[Rh(dmg)_2ClBr]\cdot 2H_2O$; with NH_4CNS the product was $NH_4[Rh(dmg)_2ClCNS]$; with thiourea, the product was $[Rh(dmg)_2ClCS(NH_2)_2]$, a nonelectrolyte. The ClI complex was boiled with thiourea with displacement of Cl but not I. Similarly with the ClCNS complex CNS is replaced by thiourea. M. Hosch

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000412620010-5"

Analysis

ma

*Quantitative Separation of Iridium from Rhodium by the [redacted] Method. N. K. Pshenitsyn, L. A. Prokorov, and P. V. Simanovsky (Izvest. Sekt. Platiny, 1948, 22, 22-27; C. Abs., 1950, 44, 10583).—(In Russian). The proposed method is a modification of the Gibbs method (Chem. News, 1863, 7, (169)). Rh is precipitated with Na_2S from its hexanitrite soln. The precipitate is ignited, the Rh reduced in a current of H, cooled in CO_2, and weighed. In the filtrate Ir is re-oxidized with HNO_3 or H_2O_2 to the quadrivalent state. Then Ir is determined either by the bromide-bromate method (Moser and Hackhofer, Monatsh., 1932, 59, 45; Met. Abs. (J. Inst. Metals), 1932, 50, 200) or by the $HgCl_2.2HgO$ method. In the latter case Ir precipitates as a black or blue-black hydroxide. A scheme for determining Pt, Pd, Au, Rh, and Ir in precious-metal concentrates is given.

CA 7

Determination of ruthenium in copper-nickel slimes. N. K. Pshenitsyn and I. A. Fedorov. *Izvest. Sektora Platiny i Drugikh Blagorod. Metal., Inst. Obshchei i Neorg. Khim., Akad. Nauk S.S.S.R.* No. 22, 76-9(1948).—Treat sample with hot 10% H_2SO_4 to remove most of Cu and Ni; remove Pb by boiling in NH_4OAc. Ignite, treat with HF to remove SiO_2, and fuse with KOH and KNO_3 in a Ag crucible with sample 1, KOH 8, and KNO_3 2.5 parts. Dissolve the fusion in H_2O and filter. Fuse the residue again and proceed as before. Fuse the 3rd time if necessary. Combine filtrates and residues (if any) and heat with alc. to reduce Ru. Filter, wash, ignite ppt. (Ru, Pd, Ir, Pt, Ag), reduce in a stream of H, and cool in CO_2. Treat with 1:3 HNO_3, filter, and wash. The residue contains Ru, Pt, and Ir. Ash, filter, and fuse with 10 times of Na_2CO_3 in a Pt crucible at approx. 900°. Treat fusion with dil. HCl, heat, and filter. Residue contains Ir and possibly Ru, fuse again with Na_2CO_3, dissolve, and filter. Combine filtrates, reduce with Zn and Mg, filter, wash, dry, ignite, reduce in H, and cool in CO_2. The product comprises Ru possibly contaminated by Pt. Treat with 1:4 aqua regia, filter, wash, dry, ash, filter, ignite, reduce in H, cool in CO_2, and weigh Ru. M. H.

C. A.

6

Interaction of complex amines of rhodium with dimethylglyoxime. V. V. Lebedinskii and I. A. Fedorov. *Izvest. Sektora Platiny i Drugikh Blagorod. Metal., Inst. Obshchei i Neorg. Khim., Akad. Nauk S.S.S.R.* No. 22, 158-67(1948); cf. *C.A.* 44, 10566e.—$NH_4[RhNH_3Cl_5]$ 0.6 g., dimethylglyoxime (DMG) 0.8 g., H_2O 50 ml., and concd. HCl 2.5 ml. after 20 min. formed a yellow ppt. of $H[Rh(DMG)_2Cl_2]$. $K[Rh(NH_3)_2(NO_2)_4]$ 1 g. and DMG 1.5 g. boiled for 1.5-2.0 hrs. in 100 ml. of H_2O gave 1-2-mm. yellow needles of a new nonelectrolyte $[Rh(DMG)_2NH_3NO_2]\cdot{}^1/_2H_2O$. $[Rh(NH_3)_3(NO_2)_3]$ and DMG 3.4 g. each boiled for 10-12 hrs. in 300 ml. of H_2O yielded the same compd. as small yellow prisms. Boiling the same quantities of triammino chloride and DMG yielded a nonelectrolyte $[Rh(DMG)_2NH_3Cl]\cdot H_2O$. $[RhPy_4Cl_2]Cl$ 0.8 and DMG 0.2 g. boiled in 50 ml. of H_2O for 30-35 hrs. produced a nonelectrolyte $[Rh(DMG)_2PyCl]$.

M. Hosch

FEDOROV, I.A.

GRINBERG, A.A. (Leningrad); BABAYEVA, A.V.(Moscow); YATSIMIRSKIY, K.B. (Ivanovo); GOREMYKIN, V.I. (Moscow); BOLIY, G.B. (Moscow); FIALKOV, Ya.A. (Kiyev); YAKSHIN, M.M. (Moscow); KEDROV, B.M. (Moscow); GEL'MAN, A.D. (Moscow); FEDOROV, I.A. (Moscow); MAKSIMYUK, Ye.A. (Leningrad); VOL'KENSHTEYN, M.V. (Leningrad); ZHDANOV, G.S. (Moscow); PTITSYN, B.V. (Leningrad); ABLOV, A.V. (Kishinev); VOLSHTEYN, L.M. (Dnepropetrovsk); TROITSKAYA, A.D. (Kazan'); KLOCHKO, M.A. (Moscow); BABAYEVA, A.V.; TRONEV, V.G. (Moscow); RUBINSHTEYN, A.M.(Moscow) CHERNYAYEV, I.I.; GRINBERG, A.A.; TANANAYEV, I.V.

Explanation of the transeffect. Izv.Sekt.plat.i blag.met. no.28: 56-126 '54. (MLRA 7:9)

(Compounds, Complex) (Platinum)

Fedorov, I.A.

USSR.

Compounds of cadmium with o-phenylenediamine. I. A. Fedorov, Izvest. Sektora Platiny i Drug. Blagorod. Metal., Inst. Obshchei Neorg. Khim., Akad. Nauk S.S.S.R. 28, 166–82 (1954).—The following compds. were formed: $Cd(C_6H_4(NH_2)_2)Cl_2$, $Cd(C_6H_4(NH_2)_2)_2Cl_2$, $CdC_6H_4(NH_2)_2I_2$, $Cd(C_6H_4(NH_2)_2)_2Cl_2$, $Cd(C_6H_4(NH_2)_2)_2Br_2$, $Cd(C_6H_4(NH_2)_2)_2I_2$, $Cd(C_6H_4(NH_2)_2)_2SO_4.H_2O$, $Cd(C_6H_4(NH_2)_2)_2(CNS)_2$, $Cd(C_6H_4(NH_2)_2)_2(NO_3)_2$, and $Cd(C_6H_4(NH_2)_2)_3SO_4.H_2O$. $o-C_6H_4(NH_2)_2$ is readily replaced either partially or completely by $(CH_2NH_2)_2$, NH_3, or thiourea. Mol. elec. cond. and av. wt. of ion in H_2O were detd.; the data indicated that Cd phenylenediamine did not form stable compds. in H_2O. H. W. F.

FEDOROV, I.A.; ZAYTSEV, L.M.

Investigating the thermal properties of cadmium phenylenediamines. Zhur. neorg. khim. 2 no.8:1812-1828 Ag '57. (MIRA 11:3)
(Cadmium compounds) (Phenylenediamine) (Thermal analysis)

5(2)
AUTHOR: Fedorov, I. A. SOV/78-4-4-1/44

TITLE: Mikhail Mikhaylovich Yakshin Deceased

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 4, pp 705-708 (USSR)

ABSTRACT: M. M. Yakshin was born on September 23, 1891, in the city of Belozersk in Vologodskaya oblast'. After the High-school (1908) he finished his University education in 1915 in the physical-mathematical faculty of the University of St. Petersburg Here he began his scientific career with the study . the hydrazine oxalates. In 1915 he began working in an explosives factory. In 1921 he became a member of the Komissiya po razvitiyu v RSFSR kanifol'noy promyshlennosti (Commission for the Development of the Resin Industry in the RSFSR). As docent he was given the chair for agricultural chemistry in 1930 and he gave lectures there on the production of resin and turpentine while at the same time giving lectures on qualitative and quantitative analysis at the Voyenno-inzhenernoy akademii RKKA (Military Engineers Academy RKKA) and other institutes of higher schools in

Mikhail Mikhaylovich Yakshi (Deceased) SOV/78-4-4-1/44

Moscow. In 1935 he became a member of the Academy of Sciences, USSR and worked in the Institut obshchey i neorganicheskoy khimii im. N. S. Kurnakova (Institute for General and Inorganic Chemistry imeni N. S. Kurnakov), division for the complex compounds of platinum. Here he and Academician I. I. Chernyayev carried out investigations on the reaction rates in the hydration of various platinum complexes. In 1938 he became a candidate of the chemical sciences and in 1940 he became the first-ranking scientific co-worker. In 1944 he successfully presented his dissertation "O dielektricheskoy postoyannoy nekotorykh kompleksnykh soyedineniy platiny" ("Concerning the Dielectric Constants of Several Complex Compounds of Platinum"). Mikhail Mikhaylovich Yakshin first introduced into the chemistry of the complex compounds the concept of "coordinative refraction". The nature of the water in the crystalline complex compounds of platinum and the meaning of the atomic polarization in particular platinum compounds was investigated by him. He held several kinds of teaching positions. He was a member of the board of editors for the periodical "Izvestiya Sektora platiny i drugikh

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Mikhail Mikhaylovich Yakshi (Deceased) SOV/78-4-4-1/44

blagorodnykh metallov" (" News of Platinum and Other Noble Metals"). A list of his scientific works is given. Mikhail Mikhaylovich Yakshin died on July 5, 1958, after a severe illness. There is 1 figure.

Card 3/3

SHEVCHENKO, V.B.; FEDOROV, I.A.; AGUREYEV, Yu.P.

[Temperature effect on the extraction of the nitrates of uranyl, plutonium, and nitric acid with tributyl phosphate] Vliianie temperatury na ekstraktsiiu tributil-fosfatom nitratov uranila, plutoniia i azotnoi kisloty. Moskva, Glav. upr. po ispol'zovaniiu atomnoi energii, 1960. 19 p. (MIRA 17:1)

(Uranyl nitrate) (Plutonium nitrates)
(Butyl phosphates)

S/186/60/002/001/002/022
A057/A129

21.3200

AUTHORS: Shevchenko, V.B.; Fedorov, I.A.

TITLE: Effect of the temperature on the extraction of uranyl-, plutonium-, ruthenium-, and zirconium-nitrates with tributyl phosphate

PERIODICAL: Radiokhimiya, v. 2, no. 1, 1960, 6 - 12

TEXT: In the present paper an attempt was made to determine basic conditions concerning the temperature effect on tributylphosphate (TBP) extraction of uranyl-, plutonium-, ruthenium-, or zirconium-nitrate. Literature data regarding this problem are incomplete or not systematic. Nevertheless the knowldge of the temperature effect on extraction is important for the separation of uranium and plutonium from fission products. The present experiments were carried out with initial solutions of uranyl nitrate in concentrations of 0.01, 0.2 and 0.8 M, while solutions with other elements contained just tracer amounts of these. The tributylphosphate concentration varied from 0.3 to 3.67 M, using as diluent a mixture of saturates hydrocarbons (boiling at 182 - 222°C). During the extraction the temperature was kept with an accuracy of ± 0.1°C at 5, 10, 20, 30, 40, 60, or 80°C. Initial volumes of 10 - 20 ml were used, equilibrium was reached in

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5 - 10 min, and the samples were allowed to stand for 30 - 40 min (with 3.67 M TBP for several hours). The acidity of the initial solutions was determined by potentiometry, uranium was determined by gravimetry (or colorimetry with Na-diethyl dithiocarbamate), while Zr, Ru, and Pu were determined by radiometry. The distribution coefficient K_p was calculated from the ratio (C_o/C_{aq}) of the concentration in the organic and aqueous phase. Experimental data (Fig. 1) demonstrate that with increasing temperature the distribution coefficient for HNO_3 between water and 1.43 M TBP decreases. By increasing HNO_3 concentration a decrease in the effect of the temperature on K_p can be observed. Thus an increase from 5°C to 80°C decreases K_p twice for extractions from 0.5 N HNO_3 solutions, 1.7 times for 1.72 N HNO_3, and 1.3 times for 3 N HNO_3 solutions. Apparently, constancy of $K_{p\ HNO_3}$ [observed by B. Weaver et al, Ref. 5: J. Am. Chem. Soc., 75, 16, 3943 1953)] with changing temperature is valid only for lower acidities (from 5 N HNO_3). With increasing concentration of uranyl nitrate in TBP the effect of temperature on the extraction decreases. Thus $K_{p\ UO_2(NO_3)_2}$ for extraction of an initial solution containing 0.21 M uranium in 1.7 HNO_3 is at 5°C 2.1 times greater than at 80°C using 1.47 M TBP as extractant, while using 0.36 M TBP the value changes 1.6 times. Extractions from 0.01 M uranium solutions are even more sensitive for changes in temperature. The curves for the dependence of log K_p on

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1/T (Figs. 2, 3) demonstrate that the extraction of uranyl nitrate with TBP occurs according to the Van't Hoff equation. The reaction is isothermal and controls principally the decrease of the distribution coefficient of uranium with temperature. The temperature effect of plutonium on extraction was investigated in solutions containing and not containing uranium. The distribution coefficient of Pu^{4+} increases with temperature from 10 to 40°C (Fig. 4) and drops then with a further temperature increase. Solutions with an initial HNO_3 concentration of 0.5 N (not containing uranium) show that extractability of Pu^{4+} decreases continuously with increasing temperature (Fig. 4, curve 1). The effect of acidity on the change of the distribution coefficient with temperature interval from 10 - 40°C and is not so evident between 40 - 80°C. The present authors discuss statements of some other investigators [Ref. 8: D.W. Okendi, J. Chem. Soc., 3358 (1956); Ref. 9: G. Seaborg, J.Katz, Actinides, N.N.E.S.; Ref. 10: H.H. Anderson, The Transuranium Elements, 2, 964 (1949); Ref. 11: J.A. Brothers, R.G. Hart, W.C. Mathers, J. Inorg. Nucl. Chem., 7, 85 (1958)] concerning the state of plutonium in solutions and assume the following equilibrium in solutions with an acidity between 0.5 and 4 N HNO_3:

$$Pu^{4+} \rightleftarrows Pu(NO_3)^{3+} \rightleftarrows Pu(NO_3)_2^{2+} \leftrightarrows Pu(NO_3)_3^{+} \rightleftarrows$$

$$\rightleftarrows \underset{\displaystyle \overset{\downarrow\uparrow}{HPu(NO_3)_5}}{Pu(NO_3)_4} \rightleftarrows Pu(NO_3)_5^{-} \rightleftarrows Pu(NO_3)_6^{2-}$$

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With increasing acidity the amount of $Pu(NO_3)_5^-$ increases. Supposing the whole equilibrium system is exothermic [according to Ref. 12: R.E. Connick, W.H. McVey, J. Am. Chem. Soc., 71, 3182 (1949) $Pu^{4+} + NO_3^- \rightarrow Pu(NO_3)^{3+}$ is exothermic] the present authors consider that the increasing number of nitrate groups in the plutonium nitrate complex is an exothermic process. The observed dependence of the extractability of plutonium on the temperature could thus be explained by the effect of principally two factors: 1) the shift of the equilibrium of Pu^{4+} nitrate complexes in aqueous solutions with increasing temperature, and 2) the exothermic formation of the $Pu(NO_3)_4 \cdot 2$ TBP complexes, which can be extracted into the organic phase. In solutions with an acidity above 1.7 N HNO_3 the first factor prevails until 40°C, while above 40°C the second factor is predominant. The continuous decrease of K_p with increasing temperature in solutions with an acidity below 0.5 N HNO_3 is to be explained by the summary effect of both factors. Extractability of zirconium nitrate decreases with increasing temperature (Fig. 5) between 10 and 30°C. Above 30°C the extractability increases with temperature. The effect of temperature is more pronounced in solutions at lower HNO_3 concentration. Discussing the state of zirconium in the present investigations the authors assume, based on observations in sulfate complexes of zirconium [Ref. 16: W.B. Blumenthal, Ind. Eng. Chem., 46, 528 (1954)], that with increasing temperature the

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equilibrium between nitrate and basic zirconium salts shifts towards the formation of the latter. Thus the amount of extractable nitrate complexes decreases and accordingly also the extractability of zirconium. Increase in zirconium extractability above 30°C can be explained by the effect of some other factors, like an increase in the solubility of the zirconium solvate complex, and increasing concentration of dibutyl phosphate. Extractability of ruthenium decreases with increasing temperature (Fig. 6). The existence of the following equilibrium is assumed by D.M. Fletcher and F.S. Martin, Chemistry of Nuclear Fuels: $[RuNO(NO_3)_3(H_2O)_2] \rightleftarrows [RuNO(NO_3)_2OH(H_2O)_2] \rightleftarrows [RuNO(NO_3)(OH)_2(H_2O)_2]$. The trinitrate complex is easily extractable. With increasing temperature equilibrium shifts towards the formation of the difficultly extractable di- and mono-hydrate complexes. Thus extractability of ruthenium decreases. The maintenance of definite temperature conditions in each step of the extraction process of nuclear fuels can improve the separation of uranium and plutonium from fission products. There are 6 figures and 18 references: 1 Soviet and 17 non-Soviet.

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